Dec. 2, 1968

NOTES 12/2/68 BALCH

MISSION:

S-II-5 - As a result of finding portions of a seal from the LH_2 facility systems in the S-II-5 LH_2 tank, decision has been made to inspect the engine injectors. This will not impact shipment of the stage to KSC, which is still set for 12/7168.

S-II-6 - Stage is in A-2 Test Stand undergoing engine leak checks, which are scheduled for completion on 12/4/68.

S-II-7 - Stage is in A-1 Test Stand undergoing stage leak checks, which are scheduled for completion today. Parker prevalves are scheduled for completion this week, after which engine leak checks will be started.

S-IC-8 - Electrical "power-up" was successfully accomplished on 11/27/68. POGO modifications are complete with the exception of four check valves and an electrical DC amplifier. The stage contractor foresees no problems that would prevent meeting the static firing date of 12/19/68.

As a result of finding a standard LOX compatible wipe cloth in the LOX Pressure Compensating (PVC) duct on engine position No. 1, the remaining four LOX PVC ducts and ten of the fuel PVC ducts were inspected, with no discrepancies noted. Corrective measures are being implemented to prevent recurrence of this type of incident.

BOMEX - R-QUAL has located a set of discriminators for use at MTF in the data processing for BOMEX. R-OM-PL has made arrangements to ship the discriminators and is shipping the analog tape for use in the data acquisitions for this project.

Phasing meeting has been scheduled for 12/10/68 and 12/11/68 at ESSA Headquarters to discuss the status of the total BOMEX program and to formulate the overall BOMEX operational plan.

INSTALLATION:

University Research - A representative from the Louisiana State University Food Science Division and the Executive Director of the Gulf State Marine Fisheries Commission visited MTF on 11/25/68.

GENERAL:

Public Affairs - The New Orleans Times-Picayune has asked us to develop a comprehensive story on MTF achievements, contributions that MTF has made to the national space program, and our plans for the future, to be used for a special edition around the first of the year.

NOTES 12/2/68 BELEW

HARVARD COLLEGE EXPERIMENT (S055A) CREW INTERFACE MEETING: A meeting was conducted at MSC on November 19 to review with the astronauts the S055A (Harvard College Observatory) experiment crew interfaces. No major problems developed and the crew was satisfied with the level of detail presented.

ATM HARDWARE CONTRACTS: Negotiations were completed this week for both the digital computer and heater and control valve procurements. Contracts are being prepared and will be submitted for Center review and signoff within the next two weeks. Optimistically, contracts could be awarded as early as December 15 on both. Both of these procurements are critical as they represent complex hardware which is required in the early phases of the ground development program.

MINIMUM COST PLAN REVIEW FOR SATURN I WORKSHOP: A detailed page-by-page review of the seven volume Workshop proposal from MDAC-WD was conducted from November 15 through November 25, at Huntington Beach (virus infections in both contractor and government ranks caused the lengthy review). A baseline was established on all facets of the project so that a definitive statement of work can be established and the contractor proceed with a firm cost quote. A new seven volume set of documentation will be printed reflecting the results of this baseline review.

AIRLOCK MODULE: The final review with MSC and MDAC prior to Airlock Module contract transfer to MSFC was completed this week. Consolidated comments from R&DO on the Airlock Module work statement are expected December 2. A final revision to the work statement will then be drafted for the RFP. The target date for the RFP of December 1, 1968 will slip at least one week due to a death in the family of the man representing the MSC Contracts Office.

PROGRAM MANAGER'S MEETING: Mr. Disher plans to have a meeting with the Program Managers on December 4 (following Management Council) to follow-up the discussions and recommendations of the Bogart Cost and Schedule Task Force which were aired at MSC on November 8, as relayed by Chuck Mathews to the Program Office. Dr. Paine feels he was successful in his reclama to BOB for the full 345M for AAP. This leaves a 60 to 150M FY-70 problem for AAP, depending primarily on success of Apollo and division of certain charges.

Other topics that may be reviewed include: management interfaces between Headquarters and the Center Program Offices; transfer of MSC hardware contracts to MSFC; definitization schedule of contracts and LM software responsibility.

NOTES 12-1-68 BROWN

Negative Report

CONSTAN NOTES 12-2-68

Nothing of special significance to report.

NOTES 12/2/68 GEISSLER

1. AAP Mission Requirements Panel Meeting: This panel met at MSC on Nov. 22. Major portion of meeting was associated with action items a, b, and c, below:

a. Formulate backup program plans for utilization of backup MDA/AM/OWS and LM/ATM hardware to assure highest probability of meeting objectives of AAP Program. Significant ground rules used in this analysis are: Study should be confined to "core program," i.e., no early decoupled mission is to be considered, and it should not concern itself with disposition of backup hardware if this hardware is not flown to replace failed elements of the core program. Based on status report given by people working action item, following agreements were reached: Based on low probability of need and presently available low cost impact, retain capability for CSM/LM/ATM backup decoupled mission in event of long delay in launching backup workshop; No design effort should be expended to assure that alternate decoupled mission can be flown beyond that required for primary and backup decoupled mission; and No effort should be expended to design in or to design out the capability to revisit OWS after core program is finished. It is important to note that any decision to fly backup decoupled mission because of long delay in being able to launch backup workshop does not mean cluster mission will not be flown. Cluster mission will be flown using backup workshop and LM/ATM hardware. Backup decoupled mission, if flown, should be as close as possible to primary mission in regard to altitude, inclination, and other mission parameters in order to minimize impact of decoupled mission on hardware, analyses, ground support, and training. Panel will now go to each Program Manager with results and recommendations from this study.

b. At Sept. 26 Baseline Review Meeting, Mr. Luskin stated that MDA Port 4 would be retained as an alternate docking port for CSM. He then gave centers an opportunity to appeal this decision. Accordingly, the panel assumed an action item to study impacts of docking and operating cluster with CSM at Port 4. Impacts are many and some are quite severe. For instance, WACS system is not presently capable of maintaining attitude with CSM docked at this port. Panel will advise program offices of these findings.

c. Panel was asked by Mr. Luskin to investigate feasibility of controlled reentry of spent S-IVB Stage and MDA/AM/OWS. Study was performed and it was found that controlled reentry is feasible, but cost is quite high. Additional weight penalty to control S-IVB Stage reentry was found to be $\approx$1700 lbs. It is also feasible to control OWS, but again, the weight penalty is quite high ($\approx$ 750 lbs.). Panel will present this data to Headquarters and await further directions.

2. Solar Activity Forecasting: Our Aerospace Environment Division is exerting considerable efforts towards developing improved long-range solar forecasting techniques. Research is being conducted under contracts with four organizations to develop improved mathematical models of solar activity and to establish relationships between solar activity and planetary positions. In-house, we currently use a statistical technique to forecast solar cycle activity and are developing a prediction technique for sunspot activity and solar flare activity based upon more sophisticated techniques such as Fourier Series, power spectra, and band pass filter analysis. These efforts compliment each other but the common goal is to provide more reliable solar activity predictions, which are needed for input to orbital density predictions for MSFC's AAP and Space Station studies. We are planning to sponsor a symposium in a few months with participation by all interested groups working on solar activity prediction research. We are prepared to give you a detailed briefing on our contractual and in-house solar activity research if you so desire.

NOTES 12-2-68 GRAU

1. VEHICLE STORAGE DETERIORATION: We have completed a study of post storage Unsatisfactory Condition Reports to determine whether the failures could have resulted from storage effects and to make recommendations for minimizing the degradation of parts and materials. Of the 899 stage hardware Unsatisfactory Condition Reports evaluated, 54 were classified as highly probable storage problems, and 80 were classified as possible storage problems. The data will be furnished to the Shelf-life committee for their use in evaluating hardware life.

2. ENGINE PROGRAM: Due to a flapper check valve seal failure in the facility line at MTF, it is suspected that J-2 engines on S-II-505 could be contaminated. Approximately 6 square inches of the Kel-F material, from which the seal was made, is missing. Rocketdyne and S&ID will look at main injectors and ASI injectors for any evidence of burning, etc., and initiate tests to determine if Kel-F could float sufficiently in hydrogen to enable it to enter the stage through the fill line. If tests indicate that Kel-F could enter the system, number 5 engine will be inspected since it is closest to the fill port. Action on the rest of the engines will depend on what is found in number 5.

   ° All five engines on S-II-506 at MTF have unacceptable leakage, by our standards, at the fuel turbine seal. This is the first time that all five have exhibited a similar leakage problem, and is the first case of this leakage in a long time on a J-2 engine. Our position is that the seals will have to be replaced.

3. SA-503 CERTIFICATION OF QUALIFICATION (COQ): Component testing has been completed on SA-503 and all COQ's have been signed.

4. AMERICAN SCIENCE AND ENGINEERING (AS&E) QUALITY SURVEY: A quality survey was conducted recently at AS&E, Cambridge, Mass., in connection with their work on the ATM X-ray Spectrographic Telescope Experiment. By using the applicable NASA quality and reliability documents as a guide, AS&E has progressed from practically no formal quality and reliability program two years ago, to a fairly comprehensive program at this time. A significant number of discrepancies still exist within their system, however. Soldering workmanship was considered weak. The clean room facility was inadequate, but use of the room is not required until late 1969, and calibration activity did not receive sufficient emphasis. Several other less critical discrepancies were also noted. The Experiments Manager from Astrionics Laboratory attended portions of the survey.

NOTES 12/2/68 HAEUSSERMANN

1. Reactor-Thermoelectric Power. The midterm review of the Reactor-Thermoelectric Power for a 1975-1977 Future Space Station Study will be held December 11, 1968, from 8:30 to 12:00 noon in the 10th Floor Conference Room of Building 4200. The AEC will present a description of the power plant and R&DO Labs (P&VE, AERO, SSL, QUAL and ASTR) will present technical aspects on the use of this power plant. A detailed agenda will be distributed within a few days. A dry run will be held on Monday, December 9, in the Astrionics Executive Conference Room at 1:00. Mr. Klein, Director, Space Nuclear Systems, AEC, is planning to attend. A brief side meeting with you and Mr. Klein on this subject appears to be in order.

2. ATM Star Tracker. A design review was held last week at Bendix on the ATM Star Tracker. I attended the review and satisfactory progress was evident in the design efforts made to date. Although the tracker is basically the same as used on the OAO spacecraft, several design features had to be changed for the ATM mission. Some of the most significant changes include increased gimbal angles, capability to track several stars, improved sun/earth shine shade and protection against contamination.

NOTES 12/2/68 HEIMBURG

S-II FILL AND DRAIN LINE STRUCTURAL TEST

The S-II (V7-21) Stage Structural Test, Phase IX, was conducted at ambient temperature 11/25/68. One anomaly occurred during the test. The LH_2 fill and drain disconnect collet pin partially retracted, allowing the ground half to separate from the stage half approximately one-fourth inch at the top of the disconnect assembly. No damage occurred and the pin was reinstalled. Cause is unknown, but being evaluated.

S-IVB (MSFC)

Test S-IVB-070 was conducted 11/26/68, for a duration of 385 seconds. All engine parameters were normal and cutoff was by observer on fuel low level indication. Two special lox vent valve tests were made prior to test S-IVB-070. The lox vent valve did not freeze closed when cold helium was dumped into the lox tank during a simulated flight failure of the cold helium pressurization valve.

F-1 ENGINE

Completed fuel outboard pulsing system tests at the West Area F-1 Test Stand. Test FW-105 is tentatively scheduled for the week of 12/9/68.

F-1 TURBOPUMP

Approximately 450 seconds of run time were completed on the 503 configuration inboard PVC duct, then the PVC duct was delivered to R-QUAL for inspection. We are awaiting the results of the inspection before finalizing the remaining test program on the PVC duct. We are now planning to accumulate 2000 seconds on the PVC duct by 2/1/69.

APOLLO TELESCOPE MOUNT

Work continued on the hardware assembly in Bldg. 4649 for the development fixture. Testing was also initiated on the cinching assembly component test fixture.

NOTES 12-02-68 HOELZER

BOMEX: Computation Laboratory has transferred one tape transport to MTF. Mr. Paul Harness, Computation Laboratory is assisting in software studies for this project.

NOTES 12-2-68 JAMES

1. AS-503: (a) The three S-IVB Telemetry Transmitter Power Supplies were replaced over the weekend by three from a different vendor because the original ones were suspected to contain damaged wire bundles due to poor manufacturing techniques. The system has now been re-verified. (b) The flight tape update containing the slingshot requirement was delivered on November 27, 1968. (c) Hypergol loading, a hazardous operation which limited other space vehicle activities, was started November 27 and completed early on November 30. (d) Every effort was made to let the launch vehicle people off over the holiday weekend, so with the exception of a few people who worked on Sunday preparing for RP-1 Load today, there was little launch vehicle activity.

2. AS-504: (a) Launch Vehicle, Lunar Module and Command Service Module are all on schedule. (b) Launch Vehicle swing arm overall test (OAT) was completed on November 26 as scheduled. No major problems were encountered. (c) Launch Vehicle umbilicals are being reconnected and leak tests are being made. (d) CSM has been mated with the SLA and LM. Ordnance installation should be completed today. (e) With de-erection of BP-30 accomplished on December 1, erection of the spacecraft on the launch vehicle is scheduled for tomorrow (December 3).

3. S-IC-5 at KSC: The S-IC-5 Stage arrived at KSC on November 27, 1968, 12 hours behind schedule, due to high winds off Key West. Quick look shows that load redlines were not reached.

NOTES 12/2/68 JOHNSON

Nothing of significance to report.

NOTES 12-2-68 LUCAS

1. S-II LH_2 FILL AND DRAIN FITTING TEST: Using the "A" structure located at R-TEST, structural testing of the S-II LH_2 fill and drain fitting was completed successfully last week, thus relieving a possible constraint on the launch of AS-503. There is still the possibility that the LH_2 collet assembly shearout bolts will have to be changed but this can be done without breaking the disconnect.

2. SPACE STATION MOCKUP: The construction of the main structure of the full-scale mockup is almost complete. Efforts are proceeding at the R-ME Lab on the inside equipment and components for the compartments. The components for the Environmental Control and Life Support area of the subsystem compartment have been fabricated and stored. Work is in progress on the remaining components and subsystems.

3. FLAMMABLE MATERIALS EVALUATION: Since the initiation of our program to evaluate materials, from a flammability standpoint, in oxygen-enriched crew bay environments, we have established acceptable materials for essentially all requirements one can envision in a crew bay. For example, magnetic powder dispersed in Teflon is an adequate substitution for velcro, certain new potting compounds and encapsulants have been accepted, as well as essentially all other electrical materials. (Printed circuit boards have not been demonstrated but the technology is available to do so.) As a result, we have published TMX-53788 which includes the results of some 1600 tests on 300 materials from which approximately 20% are acceptable. Based on our studies to date, it does not appear to be an overwhelming problem to design a basically nonflammable crew bay.

4. BIOMEDICAL EXPERIMENTS: We have received notification that the first funding allotment for the biomedical experiments left MSC 11-25-68. To minimize the possibility of crew rejection of the MSFC-developed hardware, steps are being taken to have periodic crew appraisals of the equipment under development. While a firm schedule for these has not been determined, informal arrangements have been made with the Flight Crew Operations Directorate for this crew involvement during hardware development.

5. LOX COMPATIBLE ADHESIVE: Over the past several years we have pursued development of a LOX compatible adhesive system. Although some success was recorded earlier, batch to batch differences continued to cause problems. Recently, by incorporating significantly improved polymerization processes, we believe the inconsistency has been solved. Three independent batches prepared by the new technique and cured with 3 different catalysts have all been demonstrated as acceptable. This improvement paves the way for the development of a nonflammable adhesive system. MSC is pursuing this under contract; we are pursuing it inhouse.

6. PERSONAL: On 11-22-68, Mr. J. G. Williamson, Chief of our Corrosion and Surface Chemistry Section, suffered a minor heart attack. He is confined to his bed at home and will be lost to us probably until the first of the year.

7. AS-503 GSE: Vibration and acoustic assembly tests have been completed successfully at Wyle Laboratories on the ESE (Electrical Support Equipment) racks located in the LUT. Dynamic environments during AS-501 and AS-502 launches were higher than qualification test levels. New test levels and test techniques were developed. All critical relays and components were monitored functionally during testing with no malfunctions observed. Results of these tests indicate that the components can withstand the launch environment for AS-503.

NOTES 12/2/68 MAUS

DR. WYSKIDA ACCEPTS POSITION AT UNIVERSITY OF ALABAMA:

Dr. R. M. Wyskida of this office has accepted a full-time position as an Assistant Professor at the University of Alabama, Huntsville faculty. He will become a member of the Engineering Department staff and will teach Operations Research and Statistics. His assignment will be effective December 2.

Dr. Wyskida's major accomplishments have been in the area of development and implementation of various statistical analysis and cost models. He has contributed to such efforts as the Apollo Cost Study, the Rosen Studies, the Maintenance of Saturn IB Launch Capability, and recently the MSFC review of the Chrysler National Space Booster Study.

The UAH has for a long time been seeking without success a well qualified full-time instructor in the field of Operations Research. We feel that Dr. Wyskida will satisfy their needs and that his association with the University will be of benefit to MSFC through our training program.

NOTES 12/2/68 MOHLERE

NEGATIVE REPORT

NOTES 12/2/68 MURPHY

Negative report.

NOTES 12/2/68 RICHARD

Apollo 7 Corona Discharge Problem: The Apollo 7 inverter overvoltage tripping has been traced to corona discharge in an environmentally-sealed motor switch. Corona discharge occurred at a particular combination of voltage, contact spacing and ambient pressure. The spacecraft inverter outputs are 3-phase, 400 Hertz, 208 volt, phase-to-phase, which are above the critical voltage (approximately 170 volts) for corona. This particular environmental switch is located in a non-pressurized area of the spacecraft. As the switch leaked through the critical internal pressure (70,000 to 160,000 feet), corona discharge occurred resulting in an inverter overvoltage trip. This problem has been duplicated in test.

Fortunately, the launch vehicle has no potential problem in this area. Cur inverter/converter voltages are less than the critical voltage at which corona occurs. All switching which could induce a voltage high enough to cause corona is done in hermetically-sealed components which prevents the voltage/pressure relationship at which corona occurs.

NOTES 12-2-68 SIEBEL

1. Plasma Energy Analyzer: In answer to your question (Notes 11-12-68, Siebel, attached), the analyzer is a tool for fundamental plasma physics research in SSL. This particular project is carried out by Dr. Rehmann, an NSF fellow working in nuclear and plasma physics. The device has no direct application to the AAP program. The possibility of developing a plasma probe experiment, however, is being studied by SSL.

2. Zero "g" Manufacturing: At the suggestion of Mr. James Beggs, Associate Administrator, OART, we contacted Dr. John Hulm of Westinghouse Electric Company's Research Group and invited him to visit us. Dr. Hulm is an expert in super-conductive materials and alloys which are possible candidates for zero "g" manufacturing experiments. Dr. C. K. Jones, also with Westinghouse, will accompany Dr. Hulm to MSFC on December 17 to tour the ME Lab's R&D area, view mock-ups, and discuss possible space experiments with various laboratory personnel.

3. Retraining Programs: As we have reported in the past, we are in danger of losing by attrition wage board personnel with skills essential to our operations and to our capability of supporting the Center's programs. One typical such skill is electroplating. We have, however, recently been able to select and assign two candidates for training. Training requirements and schedules have been established with MA-PT (Training). On-the-job training has started. Theoretical courses should start in the near future. Another area where our manpower level is very much too low for the Center's needs is that of machining. By a recruiting effort for retraining, we have now a number of candidates who are highly skilled metal forming and assembly craftsmen. These people have no promotion incentive to participate but are interested in helping the Center programs and in broadening their own experience. The training committee will shortly make a selection of suitable candidates and MA-PT will set up a detailed training program.

NOTES 12/2/68 SPEER

AS-503 Ground Wind Constraints: We met with KSC last Wednesday and closed out Gen. Phillips' action item concerning the Apollo Access Arm (AAA) wind constraints. It was agreed to use the bending moment displays for real time monitoring of vehicle deflection limits since they are adequate and already implemented. (In using vehicle bending moments for displacement, the LUT is assumed to be rigid - a fairly good approximation.) KSC decided against installation of extensiometers on the AS-503 AAA, due to work impact. The existing primary damper arm deflection measurements cannot be used since they must be disconnected after S/C LH_2 loading due to a safety hazard (they are not presently purged). We provided KSC the necessary bending moment limits and corresponding wind speed limits for prediction purposes, based on the 10/31 arm tracking limits. KSC confirmed an increased AAA tracking capability in the East-West direction but this provides no help for the worst direction wind from the South. We have agreed to re-examine our limits for certain more critical cases utilizing KSC's most recent arm tracking capabilities. For AS-504 the following improvements are firmly planned: (1) KSC will install extensiometers on the AAP for a most direct measurement of the critical distance; (2) KSC will modify the AAA to align it with the ideal vehicle centerline; this is to remove approximately 4 inches of offset and effectively increase the allowable vehicle deflection toward the LUT; (3) KSC will formally identify all countdown conditions to be analyzed by MSFC (one past problem); (4) MSFC will provide additional data with respect to wind variations vs. altitude. (The 60 ft. reference level may not be sufficiently representative for the total vehicle wind exposure as was recently noted by Dr. Geissler.)

NOTES 12-2-68 Stuhlinger

1. OSSA SENIOR COUNCIL MEETING, your question on Weekly Notes 11/18 (attached). Some of these statements were made by representatives of the Field Centers, others by Oran Nicks and John Naugle. Oran Nicks summarized them as "opinions expressed by the assembly," and he indicated the principal agreement of the Council with these opinions.

2. OPTICAL TECHNOLOGY SYMPOSIUM AT MSFC: Mr. Frank Sullivan, OART, is planning to hold a workshop-type symposium on optical technology next year, with the emphasis placed on unmanned stellar astronomy. He requested MSFC to host the meeting, and R&DO (Experiments Office) asked SSL to take the action. We expect the symposium to be held in May or June, and we plan to offer inhouse contributions on optical testing and checkout methods, power systems, attitude sensing and control, thermal control, data systems, optical contamination, and radiation problems.

3. MAGNETOHELIOGRAPH: This project is proceeding to our satisfaction. The Zeiss filter arrived here, and Jim Zwiener, SSL, will test it next week at Kitt Peak.

4. SCIENTIFIC EXPERIMENTS FOR THE SPACE STATION STUDY: SSL has been studying a considerable number of OSSA-approved experiments in the high energy astronomy category for possible integration in the space station. Considerable duplication, complexities, and obsolescence exist now among the candidate experiments proposed during past years. Our suggested selection and grouping of desirable experiments (X-ray telescope, UV astronomy platform, high energy sensors) will be discussed with members of OSSA this week. We will write you a more detailed note on the suggested experiments after this discussion.

5. ME-MAINTAINED SPUR SHOP AT SSL: Several months ago, ME established a workshop within SSL's premises as a support to this laboratory's many needs for fabrication of mechanical and electrical parts. Experimental work being supported by this shop includes the contamination study project, film fogging studies, the proton spectrometer, meteoroid simulation experiments, in-flight experiments, and others. We feel that an urgent need has been filled by this shop, and we are greatly appreciative of ME's support.

NOTES 12/2/68 TEIR

Negative report.

NOTES - WILLIAMS - 12/2/68

1. Space Station Project Definition Plan: Comments were provided to Hdqrs. (MT) by phone on Nov. 27. The main items included place of negotiations, schedules, and funding modes for the space station study. We requested negotiations take place at the Center. As to the schedules shown, we think Hdqrs. approval in one week is unlikely to occur based on past experience. The funding mode, i.e., "cost plus fixed fee", in our opinion, is the proper way to contract a phase B definition study with its inherent lack of detail definition required for "fixed cost" contracts.

2. Nuclear Program: The work statement for the joint OART/OSSA study, "Nuclear Flight System Definition, Potential Flight Test and Early Operational Payloads", was submitted last week to OSSA and OART for review and comments. Both have indicated that it looks good and they propose no major changes. Dr. Newell has signed the PAD covering the OSSA funds ($425K) and the OART PAD (approx. $800K) is expected to be signed next week. The study will provide detailed analysis, conceptual design, and development requirements of a nuclear flight system and its evolution from flight test to early operational unmanned missions. It will also establish conceptual designs for potential flight test and early operational unmanned payloads. Hdqrs. is very anxious to get the study underway.

Our inhouse "quick look" at the Nuclear Mars Ferry Mission per Dr. Mueller's request is proceeding on schedule. We anticipate results to Doug Lord by the target date, i.e., Dec. 6.

A member of Congressman Fulton's staff has asked for "any studies or reports for possible launch configurations for NERVA". Copies of his letter went to Dr. Mueller, Dr. Beggs, and Milt Klien. We do not know the reasons for this request. Ron Harris will coordinate with SNPO in the response.

Dec 9, 1968

NOTES

Bonnie,

This is the only item in the 12-9 Notes which Mr. Shepherd thinks Dr. von Braun should read.

nancy
1-30-69

B 2/1

NOTES 12-9-68 LUCAS
12/9/68

B 2/1

3. NASA FLAMMABILITY REQUIREMENTS: A meeting between NASA Headquarters, MSC, and MSFC was held at MSFC on December 4-5, 1968, to discuss the non-metallic material flammability requirements that NASA should adopt. At present, both MSC and MSFC have their own flammability specifications (D-NA-0002 vs. MSFC-SPEC-101). A task team was established with the purpose of preparing a NASA Headquarters' flammability requirements document. This would be an overall controlling document and would establish flammability guidelines for the centers to use. In essence, this new document will be based on our MSFC-SPEC-101 and the addition of a few MSC tests. It was agreed that MSFC would report test data to MSC for inclusion in a common test data bank. The requirement for MSFC to submit all deviations and waivers to the flammability specification to MSC for approval was eliminated. Each Center will be responsible for the material control of the hardware for which it has cognizance. MSC personnel were generally receptive to MSFC recommendations for AAP.

NOTES 12/9/68 BALCH

12/9 9AS

MISSION:

S-II-5 - Stage was shipped to Michoud on 12/6/68 for transshipment from Michoud to KSC on 12/7/68.

S-II-6 - Stage is in the A-2 Test Stand undergoing post-static checkout removal from test stand is scheduled for 12/19/68, and shipment to KSC is scheduled for 1/26/69.

S-II-7 - Stage is in the A-1 Test Stand undergoing LH_2 prevalve changeout to Parker prevalves. Cryogenic proof pressure test is now scheduled for 1/14/69, and static firing is now scheduled for 1/21/69.

S-IC-8 - Static firing has been rescheduled from 12/19/68 to 12/18/68. Shipment to Michoud is now scheduled for 1/6/69.

BOMEX - Fabrication of recording and signal conditioning equipment has commenced. Five oceanographic vessels will start arriving at Gulfport, Mississippi, in March 1969, for installation of this gear, with subsequent sea trials. OSSA Advisory Committee for BOMEX has been invited to meet at MTF for their next review in January. The 800K allocated to this project by OSSA appears adequate, and no overruns are anticipated.

INSTALLATION:

University Research - Final committment has been made by MSFC for awarding Louisiana State and Mississippi State Universities certain research tasks.

GENERAL:

Legal Affairs - An investigative report is being prepared for the Department of Justice for use in the defense of three suits (Musgrove, Crawford, and Cook) recently filed as a result of the 10/31/66 accident at the S-IC Test Stand in which a Mr. Stell was killed and Messrs. Musgrove, Crawford, and Cook were injured.

Emergency Planning - Representatives from NASA Headquarters and MSFC visited MTF on 12/3168 in connection with our Emergency Planning activities.

NOTES 12/9/68 BELEW

12/9 KS

LASER RENDEZVOUS AND DOCKING SYSTEM: On December 4, representatives of I-S/AA and Astrionics met with Bill Hamby, Owen Garriott, Ed Gibson and Bruce McCandless at MSC, to discuss the ITT laser rendezvous and docking system. In summary, MSC stated they did not consider the laser system a mandatory requirement, but highly desirable to provide useful but not available docking readout information, i.e., range, range/rate, angle and angle/rate. MSFC will send a proposal to MSC for comment before we formulate a plan to present to Center management and NASA Headquarters. Dollars for implementation will be a problem.

ZERO "G" MOCKUP: A zero "g" mockup of an LM-A interim film stowage device (wooden model of structural tree with film cassette envelope) is scheduled for zero "g" aircraft testing the week of 12/9/68, at Langley. The mockup has been shipped from Grumman to MSC. Mr. Lou Prichett, Grumman consulting pilot, will probably be one of the shirtsleeve test subjects (also suited test with an astronaut).

ATM CHANGES: We continue to be faced with change requests to the ATM system as a result of more detailed definition of the Principal Investigators (P.I.'s) scientific requirements. For example, a radio noise burst monitor to provide improved flare warning capability and mechanical crosshairs for the H-Alpha No. 1 telescope, to assist NRL in data analysis, is currently under consideration. In the past, we have attempted to accommodate these types of requirements where possible; however, under the expected fiscal restrictions for the remainder of this year and FY-70, further accommodation may not be possible (unless absolutely mandatory for mission success). We are looking into this in light of the Headquarters' budget guidelines, but the time is rapidly approaching when the P.I.'s will not be totally satisfied with our responses.

ATM STAR TRACKER PRELIMINARY DESIGN REVIEW (PDR): The ATM Star Tracker PDR was held at Bendix on November 26. The design progress appeared to be satisfactory and schedule and costs were also essentially as planned.

NOTES 12-9-68 BROWN

12/9 RS

J-2 Engine - Rocketdyne will be here this week to continue negotiations for the follow-on Operational and Flight Support effort beginning January 1, 1969. The major area of disagreement is the relationship between target fee, the flight performance incentive and adjustments which would result if the number of flights occurring during the period of the contract is changed. Hopefully, we can solve this problem with an override statement concerning the number of flights, thereby, protecting both parties.

Authority to enter into a letter contract has been requested since it appears that all necessary documentation to support a completely definitized contract file will not be completed by December 31, 1968. Issuance of a letter contract will be made as a last resort to preclude a break in continuity of Apollo program support.

NOTES CONSTAN 12/9/68

12/9 9T8

Nothing of significance to report.

NOTES 12/9/68 GEISSLER

12/9 PS

1. AS-503 C' Slingshot: We have had another iteration on the slingshot attitude required for AS-503. As a consequence of Dr. Mueller's direction to avoid an S-IVB stage lunar impact, on November 21st we made the decision to make several changes. One involved changing the vehicle attitude during the LOX dump from 180 deg (relative to local horizontal) to 216 deg. A 216 deg attitude is more effective for missing the moon. In addition, the flight sequence was modified to turn the APS ullage engines on after the LOX dump to give additional impulse. These changes were based on an "earth return boundary" which had been established in an earlier study. This data indicated the new attitude and increased impulse were satisfactory. However, because of the significant velocity gain added by the APS ullage engines, we re-examined the upper bound on the allowable velocity (earth return region). Our latest data, based on the 503 C' specific profile, shows that the allowable slingshot conditions are more strongly dependent on earth-moon geometry than we realized. Changing the attitude back to the original 180 deg should be about the optimum to minimize both lunar impact and earth return. This apparently is a relatively easy change to make; just going back to the original target tapes. The APS ullage engine burn will remain in.

2. SNAP-27 SAFETY EVALUATION: We received inquiries from NASA-Headquarters as a result of the recent Management Council Meeting, at which you apparently quoted our Note on the subject item (NOTES 11/25/68 GEISSLER). It appears that the surprised Headquarters representatives at the Council Meeting had not been informed by their Nuclear Safety Office personnel of the recent findings of the Reentry Group, of which we informed you in NOTES 11/12/68 GEISSLER. It appears also, that a mission groundrule for the second Apollo landing flight has been signed off by Dr. Mueller which had been proposed by Bellcomm and which did not account for the more recent findings of the Group pertaining to the LM abort problem. Somebody must have assumed prematurely that the Reentry Group was going to certify the SNAP-27 safe for reentry without qualifications. The Interagency Safety Panel meeting this week, which will be attended for us by Mr. von Puttkamer, will hopefully clear up everything and determine whether the presently existing groundrule is still acceptable or whether it will have to be modified in accordance with the Group's findings. Our note to you reported nothing but the facts. The negative reaction to your statements at the meeting was probably caused by lack of communications at Headquarters.

NOTES 12-9-68 GRAU

1. SA-503 MODIFICATION AND VALIDATION EVALUATION (MAVE): As of 12-4-68, 426 change actions remained open on the SA-503 MAVE. However, 400 require only verification of paper work. Sixteen change actions will be closed out during CDDT and 3 after CDDT. It appears that all closeouts are on the expected schedule and will be accomplished in a timely manner.

2. TECHNOLOGY UTILIZATION: At the request of the Technology Utilization Office we have reviewed for the Baltimore Public Health Service Hospital (Dr. Hsieh), a plan to automate a physical examination system (Multiphasic Health Screening Service). We have completed the review and written a report giving our recommendations and concluding that the plan is both feasible and worthwhile. We expect later to provide assistance on quality requirements when equipment is purchased. This information is still somewhat sensitive inside PHS and HEW.

3. QUALITY & RELIABILITY SURVEY: A survey of Hamilton Standard Space Center, Framington, Connecticut, the subcontractor making the Lunar Module Abort Sensor Assembly for TRW/MSC, was conducted recently. Cooperation with the survey team was outstanding for all individuals contacted both during the two pre-survey days at Grumman Aircraft, Bethpage, New York and during the week of the survey at Hamilton. This includes the RASPO staff at Grumman, the DCAS and TRW representative at Hamilton, and the contractor personnel at Hamilton. There were discrepancies in the areas of use of inspection stamps, packaging and storage, and nonconforming materials. We also found some improvements that could be made in the area of documentation. All recommendations made are being seriously considered by the contractor. Some are being adopted immediately and others will be adopted if the cost impact is not too great.

NOTES 12/9/68 HAEUSSERMANN

12/9 9AD

1. ATM Hydrogen Alpha Display and Pointing. The ATM H Alpha displays provide the astronaut a prime method for pointing the scientific telescopes. The ATM has one H Alpha telescope which contains a photographic camera and a second H Alpha telescope without a photographic camera. Both contain TV camera systems which view the sun as seen by the "optical axes." Previously, the two Harvard College (HCO) telescope systems, A/B and C, also had H Alpha TV display capability. The present HCO system (A Modified) does not. Without the H Alpha display in the HCO A Modified instrument, the alignment and calibration between the HCO telescope, the NRL slit spectrometer and the H Alpha telescopes become more significant. This has led to a reassessment of the electronic cross hairs which are generated in the TV system and used for alignment/calibration of the aforementioned telescope systems. We are presently assessing with IO/SAA a change to a mechanical cross hair subsystem for one of the H Alpha telescopes. Considerable discussion has ensued with some of the Principal Investigators which subsystem (electronic or mechanical cross hairs) is more stable. However, the significant advantage of the mechanical cross hairs is that they can be placed in the optical/photographic field of view and, therefore, will appear on the H Alpha photographs allowing straightforward, economical data reduction. A cost/schedule impact has been requested from Perkin Elmer (contractor for the H Alpha telescopes) from which a final decision can be made whether to add mechanical cross hairs.

2. Crew Motion Experiment. For some time, Dr. Kurzhals of Langley, has been proposing through the NASA Headquarters Manned Space Flight Experiment Review Board a crew motion experiment to obtain measured data of disturbances due to crew motion. With respect to ATM, we have designed the system to operate under conditions of worse case man motion. However, this data would be useful for astronomical systems requiring higher orders of stability. To enhance the probability of flying this experiment, the objectives and some of the implementation are being tied in to the ATM. Accordingly, we are now considering whether or not we should be a co-sponsor with Dr. Kurzhals for this experiment. Since this data can be invaluable with respect to advanced systems requiring more stability, we would like to support this experiment. Factors to be considered are the manpower requirements and the working arrangement with Dr. Kurzhals.

NOTES 12/9/68 HEIMBURG

12/9 9AB

S-II STRUCTURAL TEST PROGRAM S-II (V7-21) Stage Structural Test, Phase X, was successfully accomplished 12/6/68, at ambient temperature to verify the LH_2 fill and drain disconnect shear-out capability, and to verify the safety margin of the stage at the LH_2 fill and drain disconnect under induced loads. Test results are being evaluated by P&VE. This test will be repeated with cryogenics 12/11/68.

F-1 TURBOPUMP The results of the inspection on the 503 configuration inboard PVC duct after 450 seconds of run time were inconclusive; therefore, P&VE requested an additional 120 seconds of run time on the duct, after which it will again be inspected by QUAL. The PVC duct has been reinstalled in the F-1 Turbopump Facility and a 120 second test is scheduled to be conducted on 12/9.

S-IVB TEST STAND (MSFC) Test S-IVB-071 was made on 12/4. The intended test duration of low fuel level cutoff of approximately 400 seconds was terminated at 123 seconds by a faulty cutoff button (intermittent short). All buttons will be renovated prior to next test scheduled for 12/11. Engine parameters were normal at cutoff. The lox recirculation pump inverter malfunctioned before the test and was replaced. The lox recirculation pump was replaced after the test. The fuel upper suction line lost its vacuum sometime after the test. The line was removed and the internal line had failed in what appeared to be a buckling mode. This line had been in for over 30 firings (mostly full duration). All parties have been alerted for evaluation.

S-IVB UMBILICAL FLANGE SEAL TEST As a result of leakage problems at KSC between the S-IVB umbilical debris valve and the fill and drain disconnect (AS-502), we have performed six tests for P&VE with liquid hydrogen and experienced no leakage. We have determined that technique for installation of Con-O-Seal between the flanges is critical.

STORABLE FACILITY The Orbital Workshop (OWS) Auxiliary Propulsion System (APS) Breadboard Module (designed by P&VE and built by ME) was successfully static fired in the altitude firing chamber at the Storable Propellent Facility on 12/5. The module was fired through a duty cycle to study system dynamics. Quick look data indicated no problems; the Pc and engine temperatures for the two R-1E engines were normal. Additional altitude firing tests are scheduled for the week of 12/9.

GSE TEST ACTIVITIES With the completion of Access Arm No. 9 testing, we started moth-balling the test facility since no additional service arm test requirements have been identified by KSC. The facility will be placed in a standby condition with 60 day reaction time required for reactivation per agreement with KSC. Personnel not required for periodic maintenance will be reassigned with other test operations. If required, an experienced crew can be assembled on short notice to meet future requirements.

ACCIDENT AT COMPONENTS TEST LABORATORY A man was overcome with nitrogen gas while inspecting a tank on 12/2. He was revived and returned to work the same day with no ill effects. An investigation was made. A detailed account of this is being forwarded to you by memorandum.

NOTES 12-9-68 HOELZER

12/9 PTS

COMPUTER GRAPHICS PRESENTATION OF C'MISSION:

On December 5, 1968, Computation Laboratory provided to Photo a movie prepared by the SC-4020 microfilmer from inputs derived from the IBM 7094, Burroughs B-5500, and EMR 6050 computers. Sequences in the movie include a 2-D presentation of the "free return" by Dr. Arenstorf's method; a 2-D presentation of the C'Mission, with 10 lunar orbits of 500 miles rather than 60 miles for clarity, by the same method; a new (to MSFC) presentation of the parking orbit with TLI; and a re-entry sequence with the new method. The new method includes a rotating earth with continents portraying launch, parking orbit, TLI, re-entry, and splash. Mirt Davidson of Computation Laboratory and Lemar Bannister, a consultant hired by Computer Sciences Corporation for the project, worked many long hours for 21 days to produce the movie.

JAMES 12-9-68 NOTES

1. Flight Performance Incentive on Stages S-IC-3 thru -10: A meeting was held with Senior Boeing representatives at MSFC on December 4, 1968, for the purpose of discussing and reaching agreement on a pre-negotiation position flight performance incentives for stages S-IC-3 through S-IC-10, contract NAS8-5608. The flight performance incentives would have been based upon similar parameters now on contract with MDAC for the S-IVB stages, and IBM for the Instrument Unit. The contract with NAR for the S-II stage is still on a CPFF basis with a special award feature. Boeing declined the MSFC position for flight performance incentives. We will proceed to finalize all other agreements and a letter will be prepared for the Contracting Officer's file describing our position relative to Flight Performance Incentives within Schedule I.

2. Sanders Equipment: A failure analysis is being made of the S105 printed circuit board which caused delay of the AS-503 Flight Readiness Test (FRT). The suspected problem area has been narrowed to a capacitor, a resistor, and a particular solder joint. The board must fail in test again before we can narrow the cause further. Dissection of a similar S105 board in Quality Lab has revealed two diodes with missing "cat whiskers." Evidence points toward a burnout rather than a manufacturing defect. These two diodes are not in a circuit which would have caused the AS-503 FRT problems. We are working with Dr. Rees on a way to allow switching from one computer to another in the various firing rooms so that future failures would not cause serious stoppage of major operations.

3. AS-504: Spacecraft was erected December 3rd on schedule. Service arm#7 and 8 umbilical ejection test was successfully accomplished on December 5th. Preparation for spacecraft systems verification is presently underway and is scheduled to be completed Wednesday of this week. The system verification will then begin and will take approximately one week. No major problems have been encountered and the AS-504 checkout is progressing on schedule.

4. AS-505:

   A. S-IC-5 was erected on LUT Number 3 on December 3, 1968.
   B. S-II-5 was shipped from MTF on December 6, 1968, and is scheduled to arrive at KSC on December 10, 1968.
   C. S-IVB-505 arrived at KSC on December 3, 1968.
   D. S-IU-505 is scheduled for delivery to KSC on December 14, 1968.

NOTES 12/9/68 JOHNSON

12/9 9PS

Nothing of significance to report.

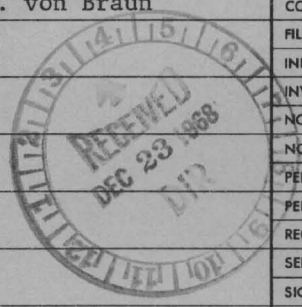
NOTES 12-9-68 LUCAS

1. "B" STRUCTURE: Reference Lucas Notes 11-25-68. Your question on transmission of Test Results to North American Rockwell (NR)/SD. - Yes! We usually have a crew of 4-5 NR/SD people here when we test. The results of each test phase are discussed with them before we go on to the next test.
2. S-II POST WELD INSPECTION PROBLEM: Our involvement with recent Material Review actions on the S-II stage indicates that post weld inspections are missing defects of the type that might cause catastrophic failure during proof pressure tests. The most recent instances are: (a) A lack-of-fusion indication was detected in the Lox bulkhead girth weld that was clearly visible in the as-welded radiographs but was never squawked. (b) A crack was detected in the dollar weld of the forward bulkhead which was also visible in the as-welded radiographs; again no squawk was generated. (c) A post assembly review of radiographs of S-II-511 has revealed two weld cracks that were not squawked during the post weld inspection. We have brought this situation to the attention of the appropriate people.
3. NASA FLAMMABILITY REQUIREMENTS: A meeting between NASA Headquarters, MSC, and MSFC was held at MSFC on December 4-5, 1968, to discuss the non-metallic material flammability requirements that NASA should adopt. At present, both MSC and MSFC have their own flammability specifications (D-NA-0002 vs. MSFC-SPEC-101). A task team was established with the purpose of preparing a NASA Headquarters' flammability requirements document. This would be an overall controlling document and would establish flammability guidelines for the centers to use. In essence, this new document will be based on our MSFC-SPEC-101 and the addition of a few MSC tests. It was agreed that MSFC would report test data to MSC for inclusion in a common test data bank. The requirement for MSFC to submit all deviations and waivers to the flammability specification to MSC for approval was eliminated. Each Center will be responsible for the material control of the hardware for which it has cognizance. MSC personnel were generally receptive to MSFC recommendations for AAP.
4. AS-503 S-IVB REAL TIME PREDICTION: On 12-3-68, a real time prediction was conducted in conjunction with the Simulation-Network-Simulation. The real time prediction was made without any problems. All required data was obtained and the schedules were met. No problems are expected in any further simulations or the launch for AS-503.
5. ATM 1-G MOCKUP: The LM/ATM 1-G mockup in our Task Analysis Facility has been updated and preliminary workstation (LM hatch and LM-end) and film cassette translation tests will begin within the next few days.
6. BIOMED EXPERIMENTS: We have now received $100,000 from the Medical Directorate at MSC for Experiments M050 and M051. Appropriate Task Team Members will get a status review at Melpar on 12-10-68 on the Lower Body Negative Pressure Device (LBNP). This was arranged through MSC and is generally indicative of their intention to discontinue any further outside contracted effort on the LBNP.
7. EFFORT TO SCRUB DOWN S-IC: Personnel at KSC were briefed on our efforts to reduce the cost of the F-1 and the S-IC. The presentation was well received and KSC agreed to support the effort to the best of their ability. The plan is to take a quick look at the effort on launch facilities and operations, and if warranted, they will mount a companion effort to the F-1A and "scrubbed down" S-IC studies proposed at MSFC.

2448

ROUTING SLIP

MAIL CODE	NAME	ACTION
		APPROVAL
DIR	Dr. von Braun	CALL ME
		CONCURRENCE
		FILE
		INFORMATION
		INVESTIGATE AND ADVISE
		NOTE AND FORWARD
		NOTE AND RETURN
		PER REQUEST
		PER TELEPHONE CONVERSATION
		RECOMMENDATION
		SEE ME
		SIGNATURE



Attached is the response of the Q&RA Laboratory to paragraph 2 of the NOTES 12-9-68 LUCAS, which is quoted in toto as follows:

2. "S-II POST WELD INSPECTION PROBLEM: Our involvement with recent Material Review actions on the S-II stage indicates that post weld inspections are missing defects of the type that might cause catastrophic failure during proof pressure tests. The most recent instances are: (a) A lack-of-fusion indication was detected in the Lox bulkhead girth weld that was clearly visible in the as-welded radiographs but was never squawked. (b) A crack was detected in the dollar weld of the forward bulkhead again no squawk was generated. (c) A post assembly review of radiographs of S-II-511 has revealed two weld cracks that were not squawked during the post weld inspection. We have brought this situation to the attention of the appropriate people."

MAIL CODE	NAME	TEL. NO.	DATE
R-QUAL-DIR	Mr. D. Grau	6-4124	12-20-68

NASA Form 26 JAN 68 PREVIOUS EDITIONS MAY BE USED. GPO : 1968 O—288-167

Mr. Smith, 6-6226

Mr. Heimburg, R-P&VE-DIR

DEC 19 1968

R-QUAL-AE-304.68

Director, Quality & Reliability
Assurance Laboratory, R-QUAL-DIR

Post weld inspection of S-II hardware

1. Based on recent Material Review actions on the S-II stage, we acknowledge that some defects have been inadvertently missed and we too share the concern already expressed by P&VE Laboratory that such defects may be of an intolerable magnitude.

2. In order to better understand the problem, we immediately initiated a review of past and present inspection performed on each stage with results as noted:

a. S-II-1 through S-II-4 - Post weld X-rays were reviewed by NR Quality Inspection, NASA-RMO Inspection plus a complete review by NR Materials and Processes Laboratory and MSFC personnel. This amounts to four complete reviews of the X-rays. Review was made without magnification except in selected areas when questionable indications were found.

b. S-II-5 through S-II-7 - Post weld X-rays were reviewed by NR Quality Inspection, NASA-RMO Inspection plus a sample review by MSFC personnel without magnification except when questionable indications were found.

c. S-II-8 through S-II-10 - Post weld inspections were made by NR Quality Inspection, NASA-RMO Inspection, plus NR M&P Laboratory audit which consisted of sample review of approximately 200 X-rays per month, plus sample review by R-QUAL-A/NR personnel. Magnification used only when questionable indications were found.

3. During the X-ray inspection on S-II-10 after the second pneumatic test, a .100 transverse crack was detected in the forward LH_2 bulkhead dollar weld. A comparison with X-rays taken after the second hydrostatic test indicates the crack was present then, was detectable with the naked eye, and should have been identified and repaired at that time. An MRB decision was made to repair this weld. Another questionable area in the Lox tank girth weld was .250 in size and was detected by X-ray after the second pneumatic test. Correlation with the original weld X-rays confirmed that the indication (lack of fusion) was present, was detectable without magnification and should have been identified and repaired at that time. An MRB decision was made after second pneumatic test to accept the indication without repair.

4. As a result of the belated findings on S-II-10, NR/Seal Beach initiated a review of all X-rays by NR M&P Lab, whereas before they were only doing a sample inspection. Also, R-QUAL-A/NR personnel will review X-rays of all critical areas such as weld crossovers, intersections, and repair areas. These reviews will be performed with the aid of magnification. This inspection will provide redundancy to the previous 100% X-ray review by the contractor Quality Inspection and the NASA-RMO Inspection.

5. The additional inspection related above was applied to S-II-11 with the results that three defects were found by NA M&P personnel with the aid of magnification. One defect, .075 in size, was found in the forward facing sheet of the common bulkhead. It was concluded that this defect occurred during original weld of "E" meridian. This defect was not readily detectable with the naked eye; however, once located by magnification, it could be seen with the unaided eye. This defect was dispositioned by MRB to use without repair. The second defect, .110 in size, located in the aft Lox bulkhead gore weld, was determined to be the result of the second hydrostatic test. According to both NASA-RMO Inspection and NA Quality Inspection, this defect was not detectable with the naked eye. This defect was reworked. A third defect, .080 in size, located in the cylinder three to four circumferential weld, was concluded to have occurred during reweld. This defect was not detectable with the naked eye. Repair of this crack was made by rewelding.

6. None of the two defects identified on S-II-10 and three defects on S-II-11 were previously found and submitted for MR disposition.

7. As a result of the findings on S-II-10, the following actions have been or will be taken:

a. A re-review is being made of all X-ray films on weld crossovers, intersects, and repair area, on S-II-7 through S-II-10. This will be performed jointly by NA M&P Lab personnel and both R-QUAL-A and R-QUAL-A/NR Inspection personnel. In addition, all welds in the LH_2 tank of S-II-7 will be reviewed by R-QUAL-A and R-QUAL-A/NR Inspection personnel. A more comprehensive review of all welds in other stages is contingent on the findings of the present effort. The special weld X-ray review noted here will be performed with both the unaided eye and with magnification.

b. An independent review is being made of S-II-11 and subsequent stages, with magnification, of all X-ray film by NR M&P Lab personnel with a review of all critical areas by R-QUAL-A/NR personnel. This effort will be in addition to the normal 100% X-ray review by NR Quality Inspection personnel and NASA-RMO Inspection personnel. This effectively constitutes a complete review by three separate organizations with a selected review of critical areas by R-QUAL-A/NR personnel.

c. A review is being made of all assigned radiographic inspection personnel, contractor and NASA, to determine their capability for performing radiographic inspections. Necessary periodic training and eye examinations will be provided to assure the continuous proficiency of both NASA and contractor radiographic readers.

d. In order to assist in X-ray interpretation and to provide some basis for commonality among the several film reviewing groups, the experience gained by the current effort noted in paragraph 7.a. plus the findings on S-II-10 and S-II-11 will be utilized as training aids.

8. Two conclusions may be drawn from the experience recounted herein on S-II-10 and S-II-11. They are:

a. Greater emphasis must be placed on competence of personnel assigned as radiographic readers. Action has been taken to assure that eye examinations and general personnel aptitude for this type of work are verified.

b. It appears evident that review of X-rays with the unaided eye could miss undesirable defects within a weld. Two of the three indications reported on S-II-11 could not be seen without magnification. Based on this fact, the Quality Laboratory will establish the magnification to be used and will direct the contractor to implement the requirement for reviewing X-rays with magnification. Also, inherent dangers of "washing out" defects by magnification will be clearly stated as part of the documented direction. The required review with magnification will be in addition to review with the unaided eye.

Original Signed by
Dieter Grau

Dieter Grau

cc:
DIR, Dr. von Braun
R-P&VE-M, Mr. J. Kingsbury
R-P&VE-XSH, Mr. E. Gresham
R-QUAL-J, Mr. T. McMinn

NOTES 12/9/68 MAUS

12/9 PTS

MSF TECHNICAL CAPABILITIES BROCHURE: Dr. Mueller has asked Capt. Freitag to develop a MSF brochure reflecting the technical capabilities of the manned space flight complex which he wants to have available for possible discussions with the new administration.

This brochure is to be essentially a source document for scope of activity and depth of confidence with particular emphasis on unique experimental facilities and equipment. We are currently coordinating Marshall's input which is now being developed by I.O. and R&DO. A representative from Capt. Freitag's office will be at MSFC on December 12 to accept the Center input.

VISIT OF STAFF MEMBER OF SENATE INDEPENDENT OFFICES SUBCOMMITTEE: Mr. Harley M. Dirks, number two majority (Democratic) staff member of the Senator Warren Magnuson chaired Independent Offices Subcommittee of the Senate Committee on Appropriations will visit MSFC December 11, 1968. In his staff capacity, he handles all space matters for Chairman Magnuson (D-Wash.). We are developing the proposed agenda and Center participation for this important visit which will include the new GSA computer facility which Mr. Dirks has stated he wishes to see while he is here.

MANNED SPACE FLIGHT WORK PACKAGE MANAGEMENT SYSTEM: A draft NMI was received on December 2 establishing this system for projecting and reporting Center manpower resources on a cycle with the Program Operating Plan.

The work description to be included will be at the project level (Saturn V) and generally limited to explaining significant problems or changes requiring a (large) change in manpower. One work package will be required from the Center for each project and function (some 20 functions, e.g., public affairs, budgeting, etc.). Seven summaries spread the data by first level organization (e.g., Science and Engineering), by project, and program.

Two requirements we previously objected to are still included; viz., skills by project and support contractor indirect effort. Both are difficult to project and will cause numerous questions.

We are currently coordinating comments from I.O., R&DO, and the Manpower Office which will be used to reply to MSF by December 13.

NOTES 12/9/68 MOHLERE

12/9 9PS

On Wednesday, in company with Ed Guilian, I visited LSU for the primary purpose of discussing in detail the recently signed 203(b)(6)/ Title 1C agreement (the so-called Ames agreement). In the case of Louisiana State, the agreement has particular applicability to use of facilities at MTF.

Certain of the facilities in the Component Test Building plus a Sustaining University Program Research grant from Headquarters ($200,000)will contribute to an interesting research program aimed at conversion of solid waste to high protein food.

In addition, activity continues looking toward completion of negotiations on certain tasks funded with Saturn money and assigned to LSU and MSU. These tasks, too, will to the extent possible be performed at MTF.

On Friday a visit was paid to the University of Alabama to see Dr. McLain, Vice President for Academic Affairs. During the visit the model collection you promised Dr. Rose was delivered although he was not present.

Discussions with Dr. McLain involved proposals to form a committee to study possibilities for integrating course offerings among the universities of the state. We shall hear more of this systems approach I am sure.

NOTES 12-9-68 MURPHY

12/9 JDS

Negative report.

NOTES 12/9/68 RICHARD

12/9 JAB

R&D AS-503 C' Review: An R&D AS-503 C' Review has been scheduled on December 12, 1968, Building 4202, Room 612, at 12:30 p.m. The topics for this agenda consist primarily of those areas that have not been included in the previous AS-503 reviews (i. e.: targeting process, targeting implementation, LVDC software/targeting verification, MSFC real-time mission support for AS-503). The primary elements involved in this review are ASTR, P&VE, AERO and Systems Engineering Office. Mr. James plans to attend and Dr. Speer has also been invited.

NOTES 12-9-68 SIEBEL

12/9 JD

1. ATM Thermal Control Paint: R-ME has undertaken an in-house program to spray S-13G thermal control paint on AAP hardware. Previously this paint was applied by a contractor under the direction of the Astrionics Laboratory. The in-house effort became necessary because painting is in the ATM manufacturing sequence and because of schedules and of large part sizes involved. Present requirements specify that the paint be applied to the ATM Antenna Panels, ATM Canister (Sun and LEM ends), ATM Solar Shield and various parts on the ATM Rack. These production applications are expected to begin on or about March 1, 1969. Meanwhile, test programs are underway to familiarize laboratory and shop personnel with mixing, substrate preparation, priming and paint spray methods and techniques to assure that specified results are obtained on viscosity, adhesion, thermal absorptance and emittance and paint thickness on finished parts. Also tests are being conducted to determine if the specified three-week shelf life can be extended by refrigeration. Preliminary results indicate that the shelf life at $0^{o}F$ is extended to approximately 90 days. (The price of this paint is $550 per gallon!) During application and curing, stringent specifications on ambient temperature, humidity and contamination, all of which affect the paint properties, require the use of special facilities and tooling. Fortunately, the facilities originally used for the development of spray foam insulation are entirely suitable and will be used as a "paint shop" for this application.

2. Electrical Connector Solder Joints: Our electrical shop is presently making cable connectors according to an NAR-Rocketdyne process specification. This program, initiated by R-QUAL, as a result of an engine tear-down inspection, is designed to assess the quality of the solder joints producible under this Rocketdyne process specification.

3. Cryogenic Scuba for Neutral Buoyancy Simulator: In answer to your comment (Notes 11-25-68 Siebel, attached): as soon as cryogenic scuba hardware is fully developed, we will initiate an "Operational Readiness Inspection" (ORI) in which Safety, Medical, and other personnel will participate. In regard to your suggestion about the bubble-free GE scuba system: this we know about but have not used yet. We are presently investigating possible benefits of this system. The GE system as well as other similar ones was primarily intended for deep sea diving.

NOTES 11-25-68 SIEBEL

B 11/30

11/25 SRS

1. Saturn V Damper System: Since the three arms have been completed and shipped, our involvement has declined but still remains such as to employ about five people. Since April 1, 1968 (after the last major shipment left MSFC), 50 EO's and 518 revisions have been received and processed. This was done either by modifying components returned to us, or by supplying mod kits to KSC. For example, after modification the Hook Box for ML-3 has been shipped back to KSC last week. At a meeting at KSC last week, agreement was reached to transfer the Damper design sustaining and support effort from MSFC to KSC by January 1, 1969 or earlier. MSFC-IO will transfer funds requested by KSC as soon as the official request has been received. P&VE will furnish a complete package of all drawings, EO's, waivers, manuals, test reports, and a complete history of all components. R-ME has been working on the latter and we should be in good shape in this area. ✓

2. S-II Container Welding Back-up Program: A program was started over a year ago to test, on hardware of representative size, the effect of weld imperfections and repairs and, more specifically, to compare by room temperature and cryogenic tests the properties of Pulsed Arc-MIG versus TIG welds. Two tanks 10' in diameter were built using Titan bulkheads procured from Martin. At a meeting last week with Messrs. Weidner, Heimburg, Dr. Lucas, and others it was decided to phase out this program after room temperature proof tests of the two tanks. It was agreed that sufficient experience has now been accumulated on the cryogenic properties of the S-II structure so that the expense of providing manpower, instrumentation, facility modifications and LH_2 can no longer be justified. The experience and results obtained from the manufacture and proof pressure testing of the tanks will be documented in a report for possible future applications. ✓

3. Space Manufacturing: Mr. Wuenscher participated last Thursday in a meeting of MSF personnel supporting the STAC Winter Study. At the meeting, which was called by Captain Freitag, the Bellcomm "White Papers" were discussed and handed to the representatives from MSFC and MSC for review and coordination with Headquarters and Bellcomm personnel and eventually with the STAC committee members. Seven specific areas of potential manned space flight uses during the 70's have been established. Space Manufacturing is one of these areas. ✓ The deadline for our final version of the "White Paper" back to Headquarters is November 27. ✓

4. Cryogenic Scuba for Neutral Buoyancy Simulator: The use of liquid air in back pack type life-support systems is becoming increasingly common. An example is equipment used by fire fighter personnel at KSC. Such a system, packaged as a Scuba, holds the promise of increasing the fidelity of neutral buoyancy simulation by freeing the aquanaut test subject from the restraint of the umbilical line. We have designed and are building a prototype liquid air Scuba. Component test has started. The system is designed for an in-water time of one hour while delivering air at a flow rate of five standard cubic feet per minute for both breathing and suit pressurization. ✓

M.S. Hope you have a sound safe man-rating program for that gear! B

→ Are you familiar with GE/Philadelphia's bubble-free scuba gear? If not, I suggest you contact Hilliard Page (GE). The AAP people and Chet May know him well. B

NOTES 12/9/68 SPEER

12/9 9:15

1. Apollo 8 Operations Review: We participated in MSC's Apollo 8 Operations Review on 12/6. Control Center, crew, and ground network are ready to support Apollo 8. Some concern was expressed on the cumulative effect of S/C water vent (0.02 lb) on the orbit determination scheme which does not allow for this perturbation; the crew will shut down water boiler or alternate opposite "thrust" directions. A late Apollo 7 finding indicates inadequate CM/SM separation distance at re-entry; investigations are continuing. If launch occurs on 12/21 on time, the crew will land in darkness and will wait in the CM for 40 minutes while helicopters are hovering above.

2. Ground Control of Slingshot Velocity: Recent attention by Headquarters to the effective control of the "slingshot" sequence on Mission C' may make it desirable to utilize the ground system in controlling the delta velocity applied to the S-IVB/IU. However, there is a significant uncertainty at the time of dumping in the S-IVB/IU ephemeris (position and velocity) due to guidance error as well as the uncertainty due to the propellant and APS residuals. A comprehensive error analysis appears to be necessary. Activities underway within R&DO on this subject should provide some better visibility on this problem.

3. AAP Operations Personnel for MSC: MSC has submitted to I-S/AA (Mr. Hardy) a requirement for MSFC personnel (either contractor or civil service) that they feel will be required at MSC to support Flight Operations and Crew Operations. The number of personnel is rather significant ($\approx$ 50) and obviously MSC desires complete integration of these people into their organization and to utilize them primarily as data sources. We have had an agreement with MSC on a Flight Control resident group, but with the shifting of hardware responsibility and the broadening of MSC's needs, this agreement requires adjustments. I have discussed this with Chris Kraft and scheduled a meeting with Mr. Kranz to discuss possible revisions to our Center AAP Support Agreement. I will coordinate this activity with Mr. Hardy to insure a compatible approach.

NOTES 12-9-68 Stuhlinger

12/9 ND

1. VISIT AT ERC: I spent a very profitable day at the Electronics Research Center in Cambridge, mostly with the Center's optical technology working groups. Presentations, demonstrations, and discussions centered around the question "what technical problems must be solved now in order to make space astronomy successful?" This question will also be the guiding topic for the OTES Workshop Meeting which OART and OSSA are planning for next spring, and which SSL has been requested to host at MSFC. Topics of particular interest will include segmented optics, mirror coatings, in-flight checking of alignment, pointing control systems, environmental testing, computer-controlled mirror figuring, optical sensors, and others.

2. HQ COMMENTS ON OUR REORGANIZATION: The news of MSFC's recent reorganizational step (Bulletin of 12/6) had already spread in HQ in the afternoon of 12/6. Members of OMSF, OART, and OSSA expressed great appreciation for the fact that MSFC makes a vigorous effort toward an organization that can accept and handle new, science-related projects. All of them stressed the need for more inhouse capability at all the Centers, but particularly at MSFC, in science-related areas, and they offered their wholehearted support in MSFC's effort to strengthen this Center's capability for science-related space projects.

3. HIGH-ENERGY ASTROPHYSICS EXPERIMENTS: One group of experiments originally proposed for the EMR payload package, and now being considered by OSSA for an early post-ATM-A manned mission, concerns ultraviolet cameras and spectrometers mounted on a stabilized platform. This platform has been under definition and development for some time as Astrionics Lab (ST-100). On 12/4, a review meeting was held at Astrionics Laboratory between the PI's of the Far UV Stellar Experiments and the ST-100 platform people. Dr. Carruthers/NRL, Drs. Morton and Jenkins/Princeton, Dr. Tifft/Arizona, and the MSFC personnel discussed various topics related to the mechanical and the electrical interface between the experiments and the platform. A program sequencer and the control panel display were also discussed. Marc Aucremanne, OSSA, promised additional funding support for the ST-100 on 12/5.

NOTES 12/9/68 TEIR

12/9 9TA

Negative report.

NOTES - WILLIAMS - 12/9/68

12/9 PD

1. Earth Orbital Space Station: Revisions are being made to the PAD and Procurement Plan as a result of the Mgt. Council Mtg. and review with Dr. Paine. The PAD is being revised at the request of Dr. Paine to establish a high-level Steering Group which will include Center Directors and high level Hdqrs. personnel. In his review of the Space Station effort, Dr. Paine indicated a strong desire to include significant technology advancements; i.e., the station should be considered more of an operational and functional base as compared to a base to initiate simplified experimentation, more advanced logistic concepts should be favored as compared to near term derivatives of current systems and maximum operational time in orbit should be a goal. The procurement plan is being revised to reflect decisions at the Mgt. Council Mtg. to have Hdqrs. negotiations. Mr. Whitaker, Office of Industry Affairs, felt that there should be strong Center participation in negotiations. As a result, the negotiation team is being established to be chaired by a Hdqrs. man with technical and business participants from the centers. Doug Lord anticipates that the entire package will be signed by Mgt. by the end of this month, and the procurement package released the first part of Jan. The reclama for additional FY70 funds above BOB markup ($9M) was unsuccessful. Lord did not feel that this was significant and felt that first significant funds would not be necessary until FY71. It should be noted that FY71 has been considered to be the time where we would initiate Phase D, Development. Unless things change with the new administration, the program may experience slippage as we have seen in the past.

2. Launch Vehicle Studies: We have completed the proposal evaluation on the Integral Launch & Re-entry Vehicle, and Launch Vehicle Cost Synthesis Studies and we are proceeding on schedule toward contract award before 12/31. Max Akridge (COR for ILRV) will be at MSC on Dec. 9 to coordinate our results with them and determine which center negotiates with which contractor(s). Due to the sensitivity, only the above is considered appropriate for the notes, if you desire more details I will be happy to brief you on the details.

3. Lunar Roving Vehicle (LRV): A bidders conference was held at MSFC on Dec. 4 for prospective bidders on the LRV. Ben Milwitsky (Hdqrs.) attended and the meeting was considered very successful. Ben also spent about half a day going over our plans for the study and support activities and urged us to play a stronger role in the science end of the vehicle/mission. We (including Mr. Weidner, Dr. Stuhlinger and the Labs. involved) have discussed this and are developing a plan/proposal for MSFC Mgt. consideration.

4. TV Broadcast Satellite: Contract NAS8-21036 awarded to General Dynamics Dec. 3.

Dec. 16, 1968

NOTES - 12/16/68 - BALCH

B 1-7

12/16 9TS

MISSION:

S-II-6 - Stage is still in the A-2 Test Stand undergoing post-static checkout and stage modifications. Stage unhook started on 12/15/68. All work is on schedule for removal of stage from test stand on 12/19/68, and shipment to KSC is still planned for 1/26/69.

S-II-7 - Stage is still in the A-1 Test Stand. Installation and checkout of the Parker prevalves in the LH_2 system and stage systems prestatic leak and functional checkout have been completed. All tasks are on schedule for cryogenic proof pressure test on 1/14/69.

S-IC-8 - All tests are on schedule for static firing on 12/18/68. Pre-firing Review was held at MTF on 12/13/68, with representatives from MSFC in attendance.

BOMEX - Dr. Ben Davidson, Scientific Director of BOMEX, is in the hospital for a heart operation. Dr. J. Kuettner, of ESSA, is handling aircraft measurements for BOMEX. Four of the five oceanographic vessels have now been surveyed for our equipment to go abroad starting in March 1969. One lesson learned to date is that scientific programmers must have a meteorlogical/oceanographic background to develop software for processing this type of data.

B-7

NOTES 12/16/68 BELEW

12-16-68

ATM CAMERA STOWAGE MEETING: An ATM Camera Coordination Meeting was held at Grumman on December 12-13, 1968. Representatives from the Principal Investigators, North American Rockwell, Grumman, MSC, MSFC, and NASA Headquarters were in attendance.

ATM SOLAR CELL MODULES: All of the ATM solar cell modules (approximately 850) have been received by MSFC and will be through inspection and acceptance testing this year. One hundred thirty of the early delivered modules have been returned to the vendor for minor rework and are expected to be returned to MSFC in January.

ATM HAO EXPERIMENT: The HAO thermal mechanical unit (TMU) successfully completed the thermal vacuum tests at Ball Brothers and has been accepted by HAO (High Altitude Observatory). We expect delivery of the TMU to MSFC in early January.

ATM STATUS MEETING: The ATM monthly status meeting was held in Astrionics on December 10-11. An abundance of minor difficulties was identified by the different organizations with the timely release of drawings still appearing to be the problem of most concern. The movement of components (black boxes) to accommodate adequate space for electrical connectors and to provide better thermal environment is contributing substantially to the problem. We are still maintaining prototype and flight unit schedules consistent with the approved AAP schedule (ML-15) and are currently working detailed schedules in depth with the Lead Lab. The organizations referred to insufficient manpower as one of the contributing factors to schedule difficulties.

NOTES 12-16-68 BROWN
12/16/68

B1-7

H-1 Engine - In consonance with General O'Connor a decision to terminate the H-1 Engine Sustaining Engineering Contract has been made. This is a four year CPIF Contract (FY 68 thru FY 71) to support H-1 engine production and sixteen Saturn IB flights. The hiatus in the Saturn IB flight schedule and the termination of the production program obviated the requirement for the Sustaining Engineering effort as presently constructed. We plan to contract for a low level of field engineering and logistics and to use the F-1 and J-2 sustaining base on an ad hoc basis in the event of an unexpected problem. The termination notice is presently being staffed.

F-1 Engine - After completion of AS-503 CDDT fuel leakage was observed from the overboard drain line of F-1 engine F-4024, Position 1, S-1C-3. The leak occurred after closing of the S-1C prevalves. No leakage was observed during CDDT. The leakage is believed to be an O-ring unsealing as a result of low or negative pressure developed in the seal balance cavity when the prevalves are closed and the fuel duct is drained. A similar problem was experienced on engine F-4023. It was recommended and accepted that no further action be taken and that AS-503 be flown with this engine "as is".

J-2 Engine - During the AS-503 CDDT, the S-II stage propellant utilization system and the J-2 engine P. U. valve performance was erratic. The center engine valve responded to command signals once out of four attempts and the valves on engine numbers 2 and 4 did not return precisely to the null position. The stage P. U. control system also experienced voltage drops in excess of redline limits in conjunction with the valve commands. The entire system, including engine valves, has functioned properly in post-CDDT tests at ambient temperature. The valves have been examined with special test equipment from Canoga Park and reacted normally; however, a true test could only be conducted with cryogenics on board. The valve on engine number 5 and the stage P. U. power supply and computer have been replaced with spare units. The P. U. valve was returned to Rocketdyne and functioned properly during ambient tests but during cryogenic tests the valve would not actuate with maximum voltage applied. Disassembly of the valve actuator motor revealed that the motor thrust bearing assembly had been installed backward and the belleville spring used to preload the bearing was not built to print. This is the first occurance of this type failure. We do not see any impact on AS 503.

CONSTAN-NOTES-12-16-68

12/16/68

B 1-7

Visitors

Dr. Chris Craft, Director of Mission Operations, MSC, visited the Boeing Company at Michoud Assembly Facility and spoke to Boeing factory employees. His visit was sponsored under the Zero Defects program.

NOTES 12/16/68 GEISSLER

12/16/68

B 1-7

1. SNAP-27 Re-entry: Re: the Dec 5, 1968 memo, subject as above, from Lee R. Scherer (Apollo Lunar Exploration Office) to the Apollo program Director, the following status is furnished: After five days of examining and evaluating the available information on the safety aspects of the SNAP-27, as provided in extended testimony by the diverse working groups, the inter-agency safety evaluation panel adjourned in dissension without having achieved any significant goal. Basically asked by AEC and NASA to provide the SNAP-27 with a clean bill of health, the panel felt that it was unable at this time to come up with an orderly safety evaluation, since apparently a significant number of questions remain to be answered, especially in the area of explosive yield of booster explosions and atmospheric release probabilities. Major dissenters are KSC and DOD, but individual panel members as well noted the low confidence of the supporting experts in their own numbers. While the possibility of even minor design changes or fixes to the SNAP-27 to solve the problems had been excluded by groundrule, it was brought up by several panel members that this constraint may require a second look. Our representative presented to the panel the material on the orbital and super-orbital Apollo/LM abort modes and probabilities used in reentry studies. The presentation was very well received. Continuation of the SNAP-27 safety evaluation will be attempted by the panel coordinators early next year.

2. Air Force Orbital Density Program: Dr. Leonard De Vries of our Aerospace Environment Division participated in a recent meeting of the Joint DOD Subcommittee on Orbital Density Forecasting, attended by representatives of the three AF satellite tracking networks: SPACETRACK, ETR, and Space and Missile Organization's (SAMSO) Satellite Control Facility. Discussion topics were: Methods of improving accuracy of satellite orbit predictions; use of atmospheric density and composition data recently acquired from AF research satellites; and recent research to improve orbital atmospheric models used for satellite position predictions. Two AF Aeronomy Research Satellites placed in low-altitude polar orbits in July 1968, are providing useful global atmospheric density data at altitudes as low as 120 km. Results from this program will help define atmospheric model more accurately in the 130 km to 200 km region. We anticipate improvements in orbital atmospheric models to result from our use of these AF satellite data and our OMSF supported thermosphere (140-320 km) rocket probes program. These probes provide detail diurnal density data that cannot be obtained from satellite measurements. Air Force representatives have evaluated all available atmospheric density models, and have concluded that the Jacchia Model (recommended by MSFC in 1968 revision of "Space Environment Criteria Guidelines") is currently the most representative model for orbit prediction purposes.

B 1-7

NOTES 12-16-68 GRAU
12/16 GSA

1. S-IVB-505N CHECKOUT: Approximately 9000 hours of modifications were performed on S-IVB-505N following post-static checkout. Consequently, the stage was subjected to a rather extensive checkout following modifications. Sixteen types of hardware discrepancies, believed to have resulted from modification activity, were found (wiring errors and omissions, erratic measurements, a bridge module failure, measurements requiring signal conditioning setup, inoperative channel decoder, etc.). The retest requirements review for this stage was completed recently and approximately 30 percent of all retest requirements reviewed contained errors. Since the stage had already been shipped, the total retest requirements package is being corrected for transmission to KSC as an addendum to previous retest requirements. The corrected requirements will establish the necessity for retesting the entire SSB (Single Side Band) subsystem.

2. PRESSURE SWITCH TESTING CONSOLE: Personnel of this Laboratory have developed an Automatic Pressure Switch Tester which can be used on gas operated pressure switches in all ranges from 5000 p.s.i. down into the low p.s.i. range. The system is fully automatic, provides a printed digital readout, and has a total system error of less than $\pm$ 0.15%. The system is very appropriate for production testing of pressure switches and can be used by semi-skilled personnel. It completely eliminates the human element in reading actuation and deactuation pressures that can affect the results of even the most skilled technician, and can also be used for life test and other design verification work with minimum operator time required. We are in the process of completing the documentation package, at which time it may be desirable to impose the tester on some contractors. The use of the tester by vendors would reduce production testing costs, and by eliminating human error, reduce the number of switches accepted at the vendor and later rejected by MSFC receiving inspection.

B/-7

NOTES 12/16/68 HAEUSSERMANN

12/16/68

1. Lunar Orbiter Camera. A Lunar Orbiter Camera has been obtained from surplus equipment of the Boeing Lunar Orbiter contract. Eastman Kodak and RCA were the sub-contractors for this hardware. We plan to study the packaging details of this unit and the method of automatic inflight film development.

2. CMG Bandwidth Problem. Previous notes have discussed the problem of the CMG bandwidth. Based on well correlated data from two CMG's, the following changes will be made to subsequent CMG's. (a) Preload the pivot gear trains to minimize backlash. (b) Increase the electronic gain by a factor of four thus increasing dynamic stiffness. (c) Eliminate the electronic rate crossfeed since our studies show no appreciable advantage in its use. These changes will provide a bandwidth between five to eight Hz depending upon the input levels and inner gimbal position. This bandwidth will be satisfactory for the present ATM system and potentially provide sufficient margin for systems requiring faster response.

3. Reactor-Thermoelectric Power. The mid-term review of the Reactor-Thermoelectric Power for a 1975-77 Space Station Study was held at MSFC. Mr. Klein of AEC was unable to attend but Glenn Newby, his assistant, was present. Rex Miller of Dr. Shulman's office represented OART. Mr. Witze of Bellcomm represented Doug Lord's office. The presentation was well received, particularly by Mr. Newby. We indicated our intent to make nuclear power an alternate in the Space Station Phase B definition study. Mr. Newby was in complete agreement and offered the full cooperation of AEC and Atomics International Corporation with an extension of the present working arrangement. In an afternoon splinter meeting, Mr. Miller offered to secure FY69 funds ($150-$200K) to initiate a Safety Study of a reactor powered space station.

4. Astrionics Lab Trailer Fire. A fire broke out on Saturday 14 December in an Astrionics Lab trailer used for Saturn V control system analyses. There will not be any impact on 503 prelaunch activities (prelaunch wind or real time support for go-no-go criteria); however, if there were any inflight anomalies we would be delayed in performing post flight analysis for S-II and S-IVB problems. To avoid these possibilities, we are establishing rescheduling procedures to use other equipments and reviewing irregular tours of duty for operational personnel. The trailer is approximately six years old and present value is about $40,000. Minimum replacement cost is estimated to be $190K. An investigation team for the fire will be established by the Safety Office.

NOTES 12-16-68 HEIMBURG

12/16/68

B1-7

1. AS-503:

a. S-II Propellant Utilization (PU) System: During CDDT tests of AS-503, it was noted that the PU reference voltage dropped from 114 VAC to 95. This condition is probably the result of over-saturation of the converter power supply transistors causing them to be unstable. Thus, during PU valve slew tests, erratic performance occurred on positions two, four and five. Both the computer and valve have been changed out with checked-out spares. Examination of the valve showed the tapered bearing installed backwards and the Bellville washer being out of tolerance. This caused the actuator to bind under extreme cold conditions thus requiring the high voltage to move the valve. It operated normal under warmer conditions.

b. S-IC-503 Fuel Seal Leakage: It has been determined that the No. 1 engine fuel seal leaks only during the draining operation and is a flight-worthy seal. The leak is due to a partial vacuum in the system moving an "O" ring in the seal. The draining procedure was duplicated on an engine at MSFC December 13 and the seal was made to leak at pump inlet pressures below 9 psig. The seals can be made to leak only at pressures lower than could ever occur in flight even with a tank pressurization system failure.

2. POGO: MSFC Report MPR-Saturn -68-2, "Summary and Assessment of the AS-503 POGO Suppression," will be forwarded to General S. Phillips today. This report presents a summary of the key analytical and test activities leading to the selection and verification of the four LOX line helium-charged prevalve accumulator as the AS-503 fix for the POGO phenomenon encountered during the AS-502 flight.

3. BIOMEDICAL EXPERIMENTS: In line with our goal of continuous astronaut participation during the biomedical experiments hardware development effort we gave Lt. Cmdr. McCandless a comprehensive briefing and tour of breadboard biomed hardware. He was favorably impressed, and gave us many valuable suggestions. We expect end item specifications from MSC next week. The Task Team will assess these specs and make appropriate inputs at the up-coming PRR's. Schedule, funding and manpower have been re-assessed in light of the MSC requirement for three additional pieces of hardware for each equipment item. The total cost is now slightly less then $4,000,000.

4. AEROSPIKE THRUST CHAMBER PERFORMANCE TESTS CONCLUDED: The 9th and last performance test on the nickel tubewall aerospike thrust chamber was successfully conducted recently at Rocketdyne's Nevada (Reno) Field Laboratory. This site level test achieved 1050 psia chamber pressure, 5.19 mixture ratio (LOX/LH_2) and secondary (base) flows of 2.22%, 0.42%, and 0% for a two second period. A step start was again employed in which a 900 psia chamber pressure and 3.5 mixture ratio were run for 2.5 seconds. Total run duration was 5 seconds. Preliminary hardware inspection revealed four minor tube splits in the throat region.

5. FIRST J-2S TEST CONDUCTED AT AEDC: J-2S engine J111A was successfully fired in the J-4 altitude facility at AEDC. The test consisted of 160 seconds of idle mode operation. A programmed cutoff was achieved. A second scheduled test was unsuccessful, apparently due to a facility electrical problem.

NOTES 12-16-68 HOELZER

12/16/68

B 1-7

NEGATIVE REPORT.

B 1-7

NOTES 12-16-68 JAMES

12/16 9:15

1. Sanders Equipment: (Reference 12-9-68 notes) Further x-raying of the individual diodes from the 5105 board at Quality Lab has shown that the missing "Cat Whiskers" are not missing. Apparently the type of material used was such that the x-ray of the diodes while mounted on the board did not show up the "Cat Whiskers".

2. Flight Performance Incentive for Stages S-IC-3 Thru 10: (Reference 12-9-68 notes) The letter to the Boeing Company documenting the Boeing rejection of MSFC's final offer has been prepared and will be reviewed by Gen. O'Connor prior to its being dispatched.

3. S-II Structural Test: "A" Structure - the ambient and cryogenic embilical disconnect test have been successfully completed. The test showed that the necessary margin of shear-out capability for S-II-3 bolts is satisfactory and the tank structure is adequate. Therefore, no problems exist on S-II-3. For S-II-4 and subs the tank structure has been proven adequate. The size of bolts will be determined as soon as the results from the test data has been analyzed. If a change out of the present bolts is necessary, the time required to do so would be very minimal.
"B" Structure - the end S-IC Boost Test, one of the two remaining test is now scheduled for December 20, 1968. The Max Q Alpha Test remains scheduled for December 30, 1968.

4. S-IC-8: Static firing of S-IC-8 is now scheduled for December 18, 1968.

5. Flight Evaluation Planning For AS-503: Due to the extremely short time between completion of flight evaluation of AS-503 and the launch of AS-504, we must maintain flight evaluation work during the holiday season. All of the contractors have committed the necessary support and Mr. Weidner has been requested to provide adequate support during this time. We hope to avoid work during Christmas Day unless significant flight anomolies are evident in the Quick Look analysis. We hope to maintain sufficient time between completion of the detailed flight evaluation and launch of AS-504 to correct anomolies without a serious schedule slippage.

NOTES 12/16/68 JOHNSON

12/16/68

B-7

OMSF-OART Biomedical-Biotechnology Planning Group Meeting-
General Humphreys and Dr. Jones co-chaired a session of their joint program planning group at MSC on December 6. The purpose of the meeting was to initiate reorganization of the group - made up of representatives from the Headquarters Program Offices, and the Centers - and to form subgroups made up principally of active research personnel from the Centers, to start outlining research plans for the FY 70-71 period. The meeting resulted in MSFC's being accorded membership on three additional subgroups. The Center now has a representative on each planning group except that for "Basic Medical-Behavioral Research."

Since this session did not get around to discussing guidelines to the subgroups, it was not evident that very much had been accomplished; however, conversations with Headquarters persons during the past week indicate that both Humphreys and Jones are serious about trying to plan a program - rather than stack up individual tasks into some ill-understood framework with the hope of generating useful and required results. The OART Program Office particularly has encouraged increased MSFC participation to the extent of making available relatively small, but significant, additional funds to increase our FY 69 research in space tooling and simulation techniques.

We are preparing a letter from you to Mr. Beggs indicating recognition of the importance of these areas to future missions of the Center, appointing members to the several subgroups and expressing a desire to participate fully in the planning and execution of the research efforts.

B 1-7

NOTES 12/16/68 MAUS

12/16/68

INSTITUTIONAL PLAN: Development of the resources data required for the ongoing programs and follow on Saturn production was started this week. The required information for this portion of the plan and the final MSF guidelines were reviewed with the Resources Management Staff Offices on Dec. 9.

In the area of future programs we met with Dr. Lucas this morning and agreed to generate manpower plans and Center capabilities in the following areas:

A. MSF Programs
   1. Space Station and Space Station Logistics
      a. Saturn Int-21 Vehicles (2 Vehicles)
      b. Saturn IB Vehicles (SA-213, SA-214, & follow-on prod. of 4 per yr)
      c. *Space Station(design, development & production)
      d. Astronomy, Technology & MFG, Experiments (design, dev. & prod.)
      e. Integration of all Space Station Experiments
      f. Reusable Logistic Vehicle
      g. Titan III-Centaur
   2. Lunar Exploration Program

The majority of the new developments in the lunar exploration program will not be assigned to MSFC. Assume that MSFC will be assigned responsibility for the:

   a. Saturn V vehicles (thru 515 & follow-on prod. of 2 per yr)
   b. Automated lunar surface rover and associated experiments (design, development and production)
   c. The lunar surface rover mission control center at MSFC (development and operation)
   d. Moderate Depth Lunar Drill

B. Other Program Offices (OART, OSSA)

It is assumed that MSFC will not be assigned any major responsibility for non MSF programs (with the exception of nuclear stage development). Assume non MSF activities to be:

   1. Level of effort - ART/SRT
   2. Nuclear Stage Technology and Development
   3. Grand Tour Payload
      a. With Nuclear Stage
      b. With ~~XXXXXXXXXXXXXXX~~ Titan IIID/Centaur

*Assume other Centers will be responsible for the new logistics spacecraft and the biological, medical, earth resources and meteorogical experiments.

The data generated will be reviewed with the Staff Luncheon Group in January to establish MSFC priorities and to determine which items should be submitted to MSF.

NOTES 12/16/68 MOHLERE

12/16 9TS

B 1-7

Negative Report.

NOTES 12/16/68 MURPHY

12/16/68

B 1-7

1. Fire at Astrionics Laboratory in Trailer T-7:

On December 14, 1968, at 4:15 p.m., the security patrol discovered a fire in a trailer located near building 4487. The trailer housed analog and digital computer equipment utilized by Astrionics for performing flight simulation and flight dynamic studies. A majority of the equipment is approximately six years old. The extent of damage is major. The cause is unknown at this time including the fact that the automatic CO_2 fire extinguishing system apparently did not work. There is no program impact to the Apollo 8 flight. Future program effects are being evaluated. An investigation board will be established today.

2. Color Coding/Marking of Piping Systems:

We recently issued an MSFC Standard for Color Coding/Marking of Piping Systems in response to Apollo Program Directive #38. A potentially hazardous situation has existed at our different organizations and contractors' plants because of the various codings and markings used to identify materials carried in the piping. The issuance of this standard represented a significant accomplishment by R&DO working under the chairmanship of the R-SE Systems Safety Group. Copies of this standard have been supplied to Mr. Lederer and Gen. Phillips. It has been well received and there are now considerations to make it an MSF or NASA Standard.

3. Safety Survey Program:

As you recognize, our prime Saturn contractors will continuously reduce their engineering personnel in the future. This reduction will result in the loss of experienced test engineers, panel operators, design engineers, etc. The impact of this loss is already being felt by our contractors in the processing of their stages. To ensure that we retain a strong system of vehicle processing with special emphasis on avoiding hazardous and maintaining qualified personnel, we are working with IO and R&DO to develop criteria and arrive at a schedule for the conduct of surveys of our contractor safety programs. Through these surveys, we can also replace or combine Headquarters Safety Reviews which are currently scheduled to be conducted beginning early in Calendar Year 1969.

B 1-7

NOTES 12/16/68 RICHARD

12/16/68

AS-503 C' Review: R&DO held a Technical Review, December 13, on AS-503 C' Mission Implementation. While it was late in the game, it provided an opportunity for the R&DO family to review the implementation of the first lunar mission. Dr. Rees, Saturn V Program Management, and Mission Operations were present. We are pleased with the preparations for this mission, and I feel special credit is due the R&DO working troops for a job well done.

B 1-7

NOTES 12-16-68 SIEBEL

12/16/68

1. Laser Coolant Study: The life of the glassware in high powered lasers used for welding or metal removal is limited. The reason is that the ultra-violet light output from the flash tube must be absorbed because it inhibits lasing. Hitherto, the UV has been absorbed by the glassware which after a few shots becomes badly solarized and useless. A new idea developed in ME was to absorb the UV in the coolant and so be able to use quartz glassware which passes UV radiation. A contract was negotiated with Auburn University to perform research for such a coolant. The result of the study yielded a coolant composed of copper sulfate in a 4 to 1 volumetric mixture of Ethanol and Methanol. We are now in the process of reconfiguring a laser system to try the Auburn recommendation.

2. Miniature CO_2 Detector for Underwater Use: For neutral buoyancy simulation work, a CO_2 detector to monitor the breathing gases is most desirable. The detector must offer: (a) continuous readout, (b) insensitivity to other gases/vapors (e.g., water vapor), (c) accuracy, (d) miniaturized packaging, (e) operation at safe voltages, and (f) capability of full water immersion at operational depth. No single commercially available instrument is known to embrace all these characteristics. Within R-ME, a suitable CO_2 detector is being developed especially for neutral buoyancy application. The instrument is essentially a miniature infra-red spectrometer tuned precisely to a principal CO_2 absorption band at 4.25 microns. A "glo-bar" is used as an infra-red source; the broadband of energies thus produced is transmitted through a special band-pass optical filter which limits the emergent beam to an extremely narrow band of energies centered at a wave length of 4.25 microns. This energy passes through a 10 centimeter sample cell where it is more or less absorbed as a function of CO_2 concentration. Emergent energy levels are detected with a very sensitive Bolometer, amplified suitably, and sent to a direct recording or readout system. Preliminary experimentation has been very encouraging with good response being obtained to small changes in CO_2 concentration. Major remaining problems include: (a) optimization of the band-pass optical filter, and (b) miniaturized packaging.

B 1-7

NOTES 12/16/68 SPEER

12/16/68

1. AS-503 Real Time Support: The real time support to MSC which was reviewed in the R&D meeting on Friday, was again exercised during the network simulation on Saturday. In spite of numerous data transmission problems from the network sites, most aspects of our scheduled activities were tested and satisfactorily checked out. All HOSC real time support groups are ready to support the C Prime mission.

2. MSFC Personnel at LCC and MCC for Apollo 8: Arrangements have been completed for MSFC invitees for the Launch Control Center (LCC) and Mission Control Center (MCC) for the Apollo 8 mission. Dr. Rees, General O'Connor, Mr. Weidner and Dr. Rudolph will be with you in the Operations Management Room. Lee James will be on the Firing Room floor. In addition, MSFC will have four people in the Operations Support Room, thirteen people in the Operations Viewing Room at KSC, and sixteen people in the MCC Main Viewing Room at MSC.

3. AS-503 Priority Mission Data: Arrangements are being made with KSC and GSFC on expediting selected flight data for post-flight evaluation. Provisions are being made to air-snatch the Redstone, Mercury and Huntsville data covering pre-ignition sequencing and S-IVB second burn.

4. Release of Canary Island C-Band Radar Support: At the request of MSF/MO (Stevenson), we have investigated the possibility of deleting the MSFC requirement for Canary Island C-Band Support. Although this is in a good location for tracking geometry, the data quality output has been inferior due to the characteristics of this mobile station. Therefore, we will concur that the equipment be transferred to Wallops Island at the request of OTDA.

NOTES 12-16-68 Stuhlinger

12/16/68

B1-7

1. X-RAY TELESCOPE DEFINITION: At the X-ray project planning meeting at Columbia on 12/9, it became evident that more time will be required by the potential PI's to work out their requirements. An extended working session for that purpose is being planned for the second week in January. Members of ASTR, ASO, and SSL are participating in this study project.

2. SUPPORT OF SPACE STATION STUDY: A roundtable discussion on procedures for completion of the ASO Experiment Analysis Forms was held on 12/12 between ASO, SSL, and Brown Engineering personnel. Many problems still exist concerning terminology format, and technique in supplying the space station designers with the necessary experiment information. It is hoped that all the descriptions and analysis forms for the Functional Program Elements in all disciplinary areas can be completed early in January.

3. EXPERIMENT TO-27: The Preliminary Design Review (PDR) for the contamination experiment TO-27 was held on 12/11. While the final tabulation of the discrepancies is not yet available, it appears that few of them are against the design itself; most were against the integration documentation (for which SSL is not responsible). It is expected that all discrepancies will be resolved in due time, and that the experiment will proceed without delay.

4. HELIOMAGNETOGRAPH PROJECT: The dome which will house the heliomagnetograph on top of the old Redstone test tower (half a mile east of the Medical Center) was placed in position on 12/12. All the various phases of this project are moving satisfactorily at the present time.

5. X-RAY INHOUSE WORK: During recent X-ray astronomy studies, it became apparent that information and even basic knowledge on X-ray reflection, penetration, and absorption, as needed for the design of X-ray telescopes, are badly missing. Rather than attempting to fill this gap by contracted work, SSL and ASTR (Applied Research Branch) have decided to start a joint inhouse experimental program. Most of the necessary equipment and instrumentation is existing, and manpower needs can be met within present limitations. We hope to make substantial contributions to X-ray physics and astronomy with this effort.

These Notes will be my last as Director of the Space Sciences Laboratory. I have promised Hermann Weidner that I will remain close to my old Lab until a successor has been found. My former Deputy, Jim Downey, will act as Director during this time.

In my new position, I will consider it my foremost task to rebuild throughout the Center the capability, and the willingness, to do scientific and advanced technological work inhouse. With this capability and willingness, acquisition of a "scientific image" should be a natural process.

B

B 1-7

NOTES 12/16/68 TESSMANN

12/16/68

S-IVB BATTLESHIP (MSFC)

Two test series related to AS-503 launch were performed this week. The first simulated worst condition failure of cold helium supply valve to close during boost thus dumping LH_2 temperature helium through the lox vent valves. In this case, freezing of the lox vent valve did occur. Second series was to verify failure of cold helium valve from AS-503 which had failed to close properly during special blowdown during CDDT of AS-503. Failure was reproduced, but according to Douglas, not exactly the same. Additional tests to be accomplished today. Both tests were followed by successful engine firings (Tests S-IVB-72 and 73) for 435 and 398 seconds, respectively.

F-1 TURBOPUMP

A 140 seconds F-1 trubopump test was successfully conducted at the Turbopump Facility on 12/9/68. This test was conducted for the purpose of accumulating additional run time on the 503 configuration lox inboard PVC duct. After the test the PVC duct was removed from the facility and visually inspected. No evidence of cracking was found. The duct has been returned to R-QUAL for a detailed inspection. Additional testing on the inboard and outboard lox PVC ducts is scheduled after the first of the year.

F-1 ENGINE

Final preparations were made for Test FW-105 on the West Area F-1 Test Stand. The test, for additional POGO data, is scheduled for the week of 12/16/68.

S-II STRUCTURAL TEST PROGRAM

S-II (V7-21) stage structural test, Phase XA, was successfully accomplished on 12/11/68, at cryogenic temperatures to verify the LH_2 fill and drain disconnect shear-out capability, and to verify the safety margin of the stage at the LH_2 fill and drain disconnect under induced loads. Preliminary test results indicated that a shear-out capability does exist.

APOLLO TELESCOPE MOUNT

Reference your question on NOTES 12/2/68 HEIMBURG (copy attached). Cinching mechanism is used to retain solar panels in undeployed condition for flight.

S-IC-8 (MTF)

The acceptance firing of S-IC-8 is scheduled for 12/18/68.

B 1-7

NOTES - WILLIAMS - 12/16/68

12/16/68

1. Space Station Study: The Space Station Consolidated (OMSF-MSC-MSFC) Work Statement (4th draft) is now being reviewed by the various Hdqrs. offices. Lord's shop will start revision next week with inclusion of comments received into a 5th draft. The 4th draft was mailed Dec. 12 to the members of the Mgt. Council for review and comment. The letter appointing the SEB and the space station procurement plan are now in the approval cycle in Hdqrs. Signature is hoped for before holiday period starts. I understand that it is tentatively planned (or hoped) the SEB can be convened at KSC just after the Apollo 8 launch. This would put the initial SEB meeting on Dec. 21, 22, or 23. The space station PAD went to Mathews' office on Dec. 10. It still must go to Dr. Mueller, Mr. Finger, and Dr. Paine. No sign-off dates are being postulated at this time. The Hdqrs.' target date for RFQ release for the space station study is Jan. 2, although they now admit it may slip 2-3 weeks. Hdqrs. is working toward a mid-Feb. (target dates 11 and 12) Agency meeting (200-250 participants) to review the overall space station program. The meeting is currently being considered for an off-site location (e.g., Williamsburg) and would begin with an introduction by Dr. Paine describing overall Agency plans in this area followed by review of concepts, including program objectives, overall operational approaches, logistics, and definition of the basic problems. The meeting is primarily planned to bring elements of the Agency (OART, OSSA, OTDA) that have not been working the problem in detail, up to speed and obtain their participation. The discussions are planned to allow assessment of the technological readiness leading to support from OART, etc. Hdqrs. anticipates it will need Center support, especially in the assessment area. Donlan has a tentative agenda and will notify us as soon as thoughts are jelled enough for useful discussions. We have offered to help in any way we can.

Bonnie
Any news on that plan?
B

2. Integral Launch & Reentry Vehicle Study: We have completed the MSFC and joint MSFC/MSC evaluations of the proposals and have requested authority to negotiate with the selected contractor from Hdqrs. There may be a slight delay due to some re-thinking on the part of Dr. Mueller as to what exactly he desires from the study. The current work statement calls for a look at several classes of systems (i.e., 260" solid + S-IV B + Spacecraft-cargo, propulsion modules --- out to --- A/C type reusable systems) and Dr. Mueller may want just the A/C type studied. I will keep you informed. Do you have any inputs at this time?

3. Launch Vehicle Cost Synthesis Study: We have completed the proposal evaluation for this study and requested authority to negotiate from Hdqrs. Still hope to have this under contract by Dec. 31.